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Sharon Keeler
UNH Media Relations

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UNH's Institute for the Study of Earth, Oceans, and Space

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By Sharon Keeler
UNH News Bureau

Editors/News Directors: You can reach UNH Professor Charles Vorosmarty at 603-862-1792 (phone), 603-862-0188 (fax), or charles.vorosmarty@unh.edu (e-mail). Graphic images are also available at the following site: ftp://eos.sr.unh.edu/pub/outgoing/Science/

DURHAM, N.H. -- A University of New Hampshire study has found that population growth and economic development, in tandem with global climate change, will impact the availability of fresh water over the first quarter of this century.

The research reveals that climate change accounts for 20 percent of the impending increase in water scarcity, whereas population change and economic development account for the remaining 80 percent. The current emphasis on global climate change, say the study's authors, has obscured the critical "human issue" and its effect on water scarcity.

Published in the July 14 issue of the journal Science, the four UNH authors conclude that nearly 2 billion people currently suffer from severe water scarcity, a far higher estimate than from previous assessments. An additional one billion are expected to face water scarcity by the year 2025 due to increasing population and global climate change.

According to lead author Charles Vorosmarty, research associate professor in UNH's Institute for the Study of Earth, Oceans, and Space, water scarcity is measured in terms of water use relative to water supply. When the demand for water exceeds 40 percent of the supply, severe conditions occur which constrain economic development and can lead to significant water pollution and public health problems.

Vorosmarty says this is the first high-resolution global-scale study that combines the impacts of population growth and economic development, as well as climate change, within a common framework. Similar studies have been carried out at the country and regional levels,

but have failed to capture the geographic variability in water supply and demand. The United Nations, for example, recently tabulated that only one-half billion people are under high water stress.

"The data we analyzed included land runoff and river discharge, population, water use for agricultural, industrial and domestic sectors, and climate change scenarios in the context of river networks," says Vorosmarty. "For future projections, we used well established estimates for population growth, water use and climate change to the year 2025."

While the UNH model shows that the water supply in some areas of the world may actually diminish due to global climate change -- the southeastern United States, east Africa and southeast Asia, for example -- others, like the western United States and central Asia, may actually increase.

"Some may want to interpret these beneficial results as 'the good side of global climate change,'" says co-author Pamela Green, UNH research scientist. "But in reality, it's a more complex scenario and involves such issues as drought and flooding that require further study to determine regional impacts. While there will be some positive effects, the overall pattern reveals major increases in relative water demand resulting in water scarcity, particularly in the arid regions and urban areas."

Vorosmarty says that, while the scientific community has increased its resources devoted to the study of global climate change, the "human issue" has received far less attention. To secure a more complete picture of the future of freshwater resources, he says it will be necessary to consider how climate change and climate extremes interact with surface and groundwater, as well as how humans respond and adapt to water stress. These adaptations will involve costly investment in infrastructure like sewage treatment plants, reservoirs and irrigation.

"We tend to look at water scarcity as a series of local problems -- wells running dry in the U.S. or cholera outbreaks in Peru," says co-author Joseph Salisbury, UNH research scientist. "But, together, these reports constitute a global issue. This is one of the first studies to illustrate their cumulative impact."

"In light of this research," adds co-author Richard Lammers, UNH research scientist, "one of my concerns is that this combination of climate and population change could drive various regions into water-related conflict. We're really not prepared for global climate

change if we don't pay attention to population growth. It makes sense to study and get ready for both.

This study emerged from a year-long graduate course taught by Vorosmarty in UNH's Institute for the Study of Earth, Oceans, and Space. Additional funding for Vorosmarty's research was provided by NASA, the National Science Foundation and the Department of Energy.

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